DOCUMENT RESUME

ED 249 110 SE 045 124

TITLE	Forests and Flowers. A Spring Activity Packet for Third Grade.
INSTITUTION	Jackson Community Coll., MI. Dahlem Environmental Education Center.
SPONS AGENCY	Department of Education, Washington, DC. Inst. of Museum Services.
PUB DATE	84
GRANT	G008103172
NOTE	42p.
AVAILABLE FROM	Dahlem Environmental Education Center, Jackson Community College, 7117 South Jackson Rd., Jackson, MI 49201.
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	*Botany; Classification; *Ecology; Elementary School Mathematics; *Elementary School Science; *Environmental Education; *Field Trips; Grade 3; Interdisciplinary Approach; Language Arts; Learning Activities; Outdoor Activities; Primary Education; *Science Activities; Social Studies; Trees; Wastes

ABSTRACT

This instructional packet is one of 14 school environmental education programs developed for use in the classroom and at the Dahlem Environmental Education Center (DEEC) of the Jackson Community College (Michigan). Provided in the packet are pre-trip activities, field trip activities, and post-trip activities which focus on plants and decomposition in the built and natural environments. Strategies for using these activities with third grade students are also provided. The pre-trip activities focus on the characteristics and parts of plants, the nature and use of a classification key, and food chains. These concepts are reinforced during indoor and outdoor activities conducted during a field trip at the DEEC. These activities (and lists of formal and non-formal field trip objectives) are provided in a separate field trip guide. The post-trip activities include information to determine which factors are necessary for plants to grow, investigating urban trees, examining wood and wood products, and examining various aspects of garbage. Many of the ideas presented are useful in creating an interdisciplinary unit on plants and ecology. In addition, students completing this survey of the plant kingdom gain awareness and knowledge about the environment and practice problem-solving skills they will use throughout their lives. (JN)

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"Forests and Flowers" is one of fourteen school environmental education programs developed by the Dahlem Environmental Education Center of the Jackson Community College. Assistance for the project was provided by the Institute of Museum Services Special Project Grant #C008103172, of the U.S. Department of Education.

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Forests and Flowers

A Spring Activity Packet for Third Grade

As the days lengthen, ushering spring along its course, the plant kingdom responds dramatically. From the first crocus blossom through the parade of spring wildflowers to the flush of new leaves, the world of plants reappears like clockwork.

This incredible green collection does much more than beautify our planet. Plants are the first step in nearly every food chain, and with a few microscopic organisms, produce all of the world's oxygen; without them animal life would be impossible. Plants help maintain a comfortable climate in the summer, and plant materials are used to manufacture an endless list of goods. Even fossilized plants make critical contributions to our society in the form of energy.

This packet contains pre-trip and post-trip activity ideas to accompany a field trip to the Dahlem Environmental Education Center. You may find many of these ideas useful for creating an interdisciplinary unit on plants and ecology. Through their experiences at the Center and at school, your students will learn more about plant structure, differences and similarities among plants, soil nutrients, decomposition, and forest resources. Many of these concepts are transferable to the urban environment and most are compatible with elementary science curriculums.

Through this look at our plant kingdom, your students will gain awareness and knowledge about our environment and practice problem-solving skills they will use throughout their lives.

Contents

Goals and Objectives 1

Pre-Trip Activities

- Particulars on Plants 3
  - Let's Pretend 4
  - Write a Cinquain 4
- Plant Parts 4
  - Word Game 5
  - Plants Outdoors 6
  - Plants Indoors 6
- Tree I.D. 6
- Food Chain Refresher 7
- Wildflowers Galore 8
- Vocabulary Words 8
- Activity Sheets 1 - 4
- Parent Letter

Field Trip 11

Post-Trip Activities

- Which Plants Grow? 13
- Urban Trees 14
- Wood You Like to Know? 14
  - Forest Products Everywhere 15
  - Making Paper 15
  - The Future of Truffula Trees 16
  - To Cut or Not To Cut 16
- Garbage - Yours, Mine, and Ours 17
  - What Happens to Garbage 18
  - Class Trash 18
  - Compost Compote 19
  - Community Garbage 19
  - Recycle It 19
- Activity Sheets 5 - 7

References 21

Goals and Objectives

Program Goal

Third graders will become more aware of plants and decomposition in the built and natural environments.

Program Objectives

Students will:

-define a plant by describing the characteristics that separate plants from other organisms.

-learn about plants by identifying their parts and structures.

-understand that the sun is the source of all food energy by drawing food chains.

-demonstrate the use of a scientific key by using it to identify trees.

-learn about different common wildflowers by matching names to pictures.

-demonstrate knowledge of plants and ecology by building a terrarium.

-understand soil composition by analyzing several types of soil.

-demonstrate an awareness of decomposition by following nutrients through a simple cycle.

-learn about waste disposal in the built environment by experimenting with household and classroom garbage.

-understand some of the issues involved in forest management.

Pre-Trip Activities

The following activities introduce plants to your students -- characteristics that separate plants from other organisms, and similarities within this green world that identify them as plants. An explanation of a key -- a systematic series of observations to identify objects, like tree leaves -- is followed by a short refresher on food chains. These concepts will be reinforced during the field trip experience.

1. Particulars on Plants

The world of plants is so diverse that it is difficult to use generalizations to define a plant! For almost every characteristic there is an exception. Listed below are five broad generalizations and qualifiers about plants.

- Most plants have green leaves that utilize sunlight to produce food energy. Plants that are not green, (e.g., Indian pipe) obtain food energy through connections with other plants, dead or alive. Some plants (e.g., sundew, pitcher plant) supplement their nutrient intake with insects.

- Most plants grow in one place, attached by roots, and don't move around. Some plants float in water (e.g., duckweed) and others seem to grow in air from tree branches (e.g., Spanish moss). With new agricultural techniques many plants -- even tomatoes -- can be grown in water or air!

- Plants reproduce by seeds or spores. Some reproduce vegetatively more efficiently than they do with their seeds or spores (e.g., clones, stump sprouts).

- Plants need sun, air, water, and soil to live. They extract nutrients from soil, water, or air. Fungi, mold, and mushrooms do not require sunlight, but are no longer classified as plants. They have been moved to a kingdom of their own.

•Plants grow from their edges -- the tips of their branches, the ends of their roots, and the outer living layer of their stem. Trees grow each year; other plants grow for one season and die back in the winter. A sign nailed to a tree, however, will not climb into the air as the tree grows. The branch tips grow to increase the tree's height, the trunk doesn't.

Let's Pretend

Have your students write a story in first person, detailing fantasies about their lives as plants. They should include all of the general characteristics already explained. Illustrating their stories would also be fun!

Students can also role-play an interview with a "plant." Have one child pretend to be a plant, while a second student acts as a reporter, asking the "plant" questions about his/her life. Give the reporter a tape recorder and microphone, or, if you really want to have fun, try videotape and costumes.

Write a Cinquain

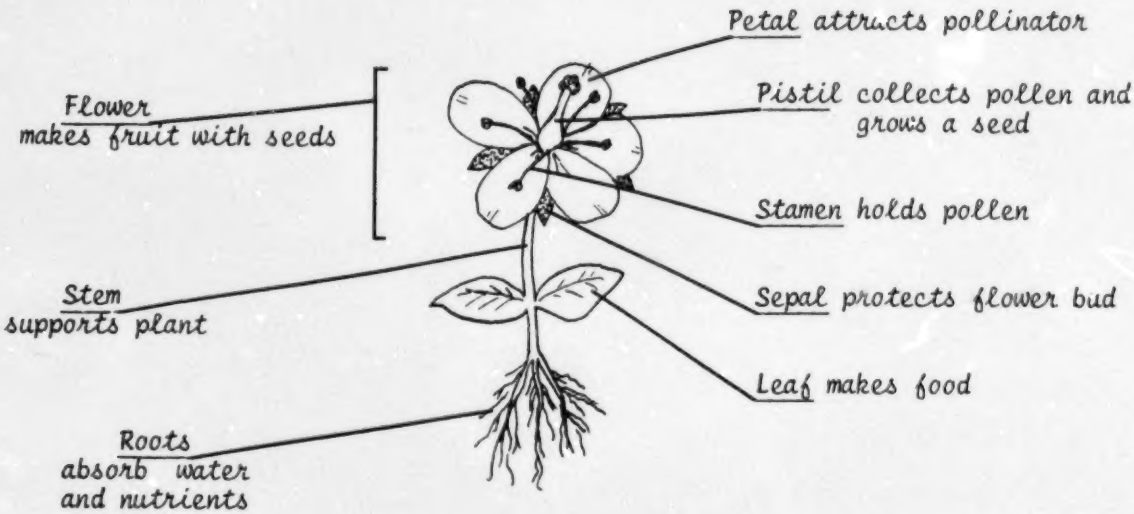
Have your students write a cinquain in the shape of a tree.

noun	*Trees*
two adjectives	*Green, beautiful*
three verbs	*Bending, growing, shading*
sentence	*Trees are homes for some animals.*
synonym	*My friends*

2. Plant Parts

Plant structures and their functions are similar from plant to plant within this kingdom. Those that have flowers display some combination of petals, sepals, stamens, and pistil(s).

A picture may be worth a thousand words, but it's nothing like a real flower. Collect flowers from a funeral home or a florist, and with the diagram on the next page, help your students identify plant parts.


Petal attracts pollinator
Pistil collects pollen and grows a seed
Stamen holds pollen
Sepal protects flower bud
Leaf makes food
Flower makes fruit with seeds
Stem supports plant
Roots absorb water and nutrients

Let your students use their imaginations on Activity Sheet 1. They can have fun drawing unique flowers and reviewing plant parts at the same time.

Most plants reproduce by seeds, and most seeds are made from flowers. Pollen, held in the central part of the blossom on the stamen, must come into contact with the pistil of the same flower or another of the same species, to begin seed development. This transfer, called pollination, may depend on the wind, a variety of insects, or even a few birds and bats!

These seeds are often packaged in a fruit for distribution by animals, wind, water, or mechanical means. The seed contains the nutrients and food energy the young plant will need to germinate and begin growth. Your refrigerator probably contains a wealth of seeds and fruits, if you don't mind students perusing your lunch! Apples, green beans, lemons, peppers, cucumbers, and peanuts are examples of fruits we eat.

Many non-flowering plants ensure future generations by producing spores, tiny dust-like specks that grow into plants. Ferns, horsetails, and mosses produce spores. It takes a practiced eye to notice when these plants are reproducing.

Word Game

Activity Sheet 2 has a word game to help your students review these words.

Plants Outdoors

Tour your school ground identifying plant parts. Where is the stem on a tree? (trunk, branches) Can you find the flowers on a maple tree? (The red flowers fall off the tree just as the leaves reach full size.) And where is the leaf on grass? (The blade is a leaf; the stem is reduced. If we stopped cutting grass it would grow tall and even bear a flower!)

Plants Indoors

One of the best ways for students to understand how trees grow and produce leaves is to watch!

Cut several branches from trees in your neighborhood before the leaves come out. Let groups of students look at the branches, measuring and recording their observations.

Place the cut end of the branches in a glass of water, and wait for the buds to burst into leaves, twig growth, and perhaps a flower. To speed the process you can add ½ teaspoon Rapid-Gro to one quart water, or smash the cut end of the twig with a hammer. Forsythia and willow are among the easiest species to force.

A tree sets buds each summer after the leaves develop. The buds protect the living tips of the tree and keep the embryonic leaves, twigs, and flowers on hold for most of the year. When the temperature, daylight, and moisture reach the proper levels for each tree, the tiny leaves expand, forcing the bud apart.

3. Tree I.D.

Introduce the idea of an identification key to your students with an example on the board. A key is a series of choices that narrows the options until only one remains. Following a key can be as much fun as tracing clues to a mystery! Choose six students and create a key that will identify each individual. The only key-writing rules are:

- each characteristic must be observable (not, for example, "born in Michigan").
- each characteristic must have only two options (e.g., "hair is brown," and "hair is not brown").
- each characteristic should be objective (not, "long hair," but, "hair is longer than 18 inches").

•each characteristic will lead you to next clue or the identity of the object.

Here is a sample:

1. A. If they are girls, go to 2.
   B. If they are boys, go to 4.
2. A. If they wear glasses, go to 3.
   B. If she does not wear glasses, it is Suzie.
3. A. If she is over five feet tall, it is Heather.
   B. If she is less than five feet tall, it is Erica.
4. A. If they have braces, go to 5.
   B. If he does not have braces, it is Sam.
5. A. If he is wearing a plaid shirt, it is Terry.
   B. If he is not wearing a plaid shirt, it is Rob.

With your sample on the board, ask your class to form small groups of three to five students and create a key. Their key could identify people, shoes, books, or pencils. Each characteristic should help divide the items into major categories, or weed out individuals. Once the keys are written, ask the groups to switch materials and follow the keys!

If your students have mastered the operation of a key, duplicate the leaf key game on Activity Sheet 3. By learning to identify a few common trees, your students will be able to apply identification skills to new trees, and enjoy discovering these "old friends" on their field trip.

4. Food Chain Refresher

Since plants are the only organisms that can convert the sun's energy to food, and since everything else eats plants directly or indirectly, they are the first link in every food chain. If your students are already familiar with food chains, they may only need a review.

Using something a student ate for breakfast, trace his/her food chain energy back to the sun. If you come across an animal product, your food chain will be longer!

Emphasize that the sun is the source of all food energy -- for us and all the animals of the forests, too. Thanks to plants, we have food to eat! Ask the class to make a food chain with a raccoon in it. How about a robin or a maple tree?

5. Wildflowers Galore

Trees aren't the only green plants in spring; many wildflowers share the glory, and most of them bloom long before the tree leaves pop from their buds. Activity Sheet 4 is a set of flash cards that will help your students learn common spring and summer wildflowers. After cutting and coloring these cards, your students can play Fish, Bingo, or quiz games. Perhaps there are some additional flowers in your neighborhood you could add.

Encourage your students to examine wildflowers, to discover plant parts, and to smell them. Only very common flowers should be picked with permission of the landowner. The flowers form the seeds, and picking flowers prevents those plants from reproducing.

Vocabulary Words

Some of the terms introduced through this program may be new to your students. These words may be used on the field trip or in the post-trip activities.

BUD - a bump on a branch in which next year's twig, leaves, and flower are held

COMPOST - a mixture of decaying vegetation (leaves, manure, food scraps) and decomposers

DECOMPOSITION - the process of rotting plant and animal matter that releases nutrients to the soil

FLOWER - seed producing plant part

LEAF - the green part of a plant that converts sunlight to food energy for the plant, either flat and broad or needle-shaped

PETAL - a decorative part of the flower which attracts insect pollinators

PISTIL - the seed-bearing, female flower part

RECYCLING - the act of reducing materials into their basic ingredients or nutrients, so these building blocks can be used in future products

ROOT - the part of a plant that grows down into the soil, supporting the plant and absorbing water and nutrients

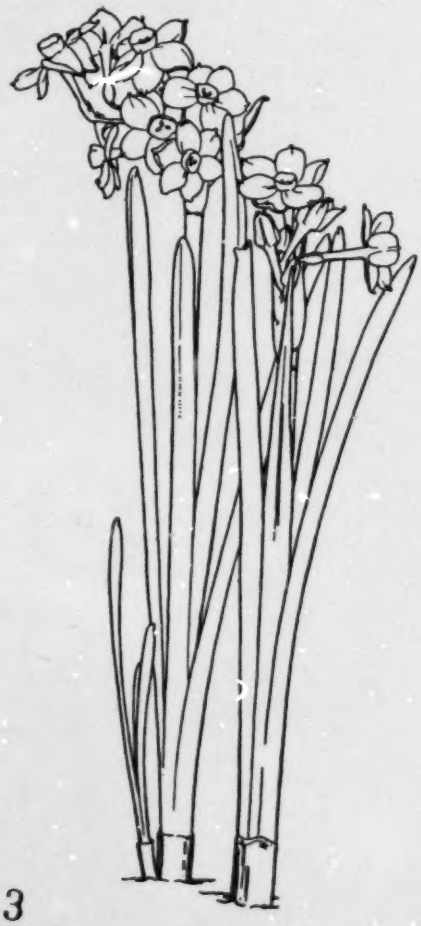
SEED - the reproductive capsule from a flowering plant that contains an embryo and nutrients for germination

SEPAL - the leaf-like part of the flower, below the petals, that protects the flower bud and can be decorative

SPORE - tiny reproductive bodies from ferns, mosses, fungi, or molds

STAMEN - the pollen-bearing, male flower part

STEM - the part of a plant that supports the leaves, flower, and fruit



Name _____

While exploring you found an unusual flower!
Draw that plant and label the parts.

Activity Sheet 1

Plant Parts

Name _____

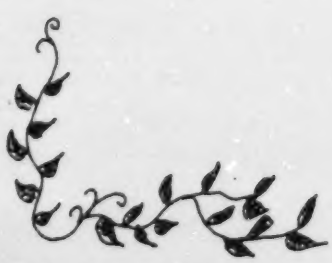
PLANT PARTS

1. Find these buried words:

flower	leaf	pistil	sepal	soil
root	seed	petal	air	water
stem	spore	stamen	sun	

S	T	A	M	E	N	Z	Q	G	O	T
F	W	B	S	O	U	A	L	M	U	P
L	A	T	E	P	T	S	E	E	D	O
O	T	R	P	I	R	M	A	S	K	L
W	E	I	A	S	I	E	F	P	S	L
E	R	A	L	T	E	T	O	O	R	E
R	S	U	N	I	N	S	I	R	O	N
L	O	O	K	L	T	L	T	E	E	S

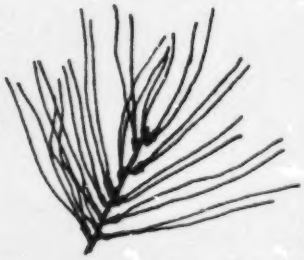
2. Now, write a story about plants. See how many of these words you can use.



Name _____

The Leaf Key Game

Use this key to identify each leaf. Write the name of the tree next to the leaf.



1. A. If the leaf is needle-shaped, go to 2.
   B. If the leaf is not needle-shaped, go to 3.

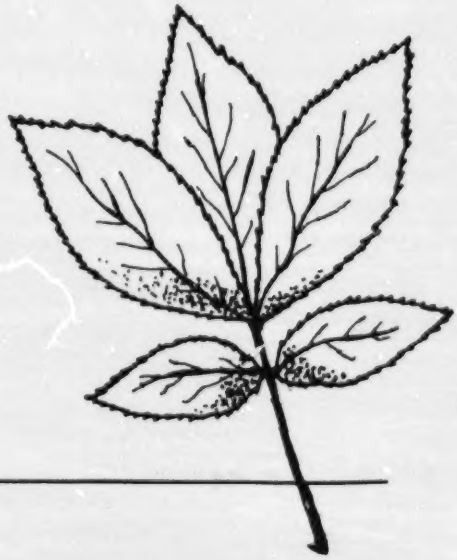
2. A. If the needles are grouped in bundles, it is a PINE.
   B. If the needles are not grouped in bundles, it is a SPRUCE.

_____ _____

3. A. If it has one leaf on a stem, go to 4.
   B. If it has more than one leaf on a stem, it is a HICKORY.

4. A. If the leaf has one main vein, it is an OAK.
   B. If the leaf has three main veins, it is a MAPLE.

_____



_____

_____

QUEEN ANNE'S LACE

You can find this tall white flower in a hot summer field. Another name is Wild Carrot. Smell a root sometime!

TRILLIUM

This protected plant blooms in the spring woods. The white petals turn pink with age. These should never be picked.

MAY APPLE

This large green umbrella-like plant protects a small white flower that becomes an apple-like fruit. Be careful -- it can be poisonous if you eat it!

GOLDENROD

In August this flower can turn a field yellow. By fall the flower will become tiny wind-blown seeds.

MARSH MARIGOLD

Where do you think this spring wildflower grows? The waxy yellow blossoms are among the first flowers to open.

CHICORY

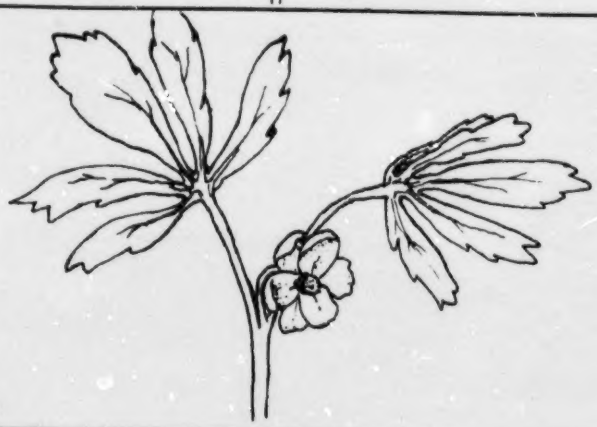
You can find this light blue flower along most country roads. It blooms in summer. The roots are used in coffee substitutes.

FIELD DAISY

Bright yellow centers and white petals are this plant's contribution to a summer field. A wide variety grow in our area.

JACK-IN-THE-PULPIT

This strange green plant is a spring wildflower. It grows from an underground bulb and will come up in the same place year after year.



Dear Parents:

Our class will be taking a field trip to the Dahlem Environmental Education Center for the Forests and Flowers program. In preparing for the trip, we've been studying plant parts, tree leaves, and tricks to identify these green friends. When we return to school, we will extend this knowledge by exploring decomposers, forest management, factors affecting plant growth, and garbage.

This is a good opportunity for you to share with and learn from your third grader. You can help your child expand his/her knowledge of the plant kingdom by encouraging any of these activities:

1. Plant a garden and watch the plants grow.
2. Use house plants to green up your home.
3. Identify and/or enjoy neighborhood trees.
4. Take a walk at the Dahlem Center to see the wildflowers.
5. Start a collection of interesting leaves.
6. Eat a meal solely of plants and their by-products, and figure out where each entree originated.

Please make sure your son/daughter is dressed for the weather on the day of our field trip. We will be spending several hours outdoors.

Thanks for your support.

Sincerely,

Third Grade Teacher

Field Trip

By now your students are probably anxious to visit the Dahlem Center and explore our forests. With the preparation you've done, their field experience will be greatly enriched.

Your program will begin with an indoor introduction, discussing the types of plants they can find near the trails, and reviewing their parts. Plants do not grow isolated from the rest of the world, so our discussion will also touch on the interactions between plants and their environment, and plants and other organisms.

Once outdoors, small trail groups will begin discovering the world of plants! Through hand lenses they'll find spore capsules on moss, stamens in marsh marigold, and bursting buds. Your students will have the opportunity to key out a few trees and learn about the contributions trees make to our world.

In a search for decomposers, they will look in rotting logs and under dead leaves, discovering important members of this nutrient-releasing cast. Students will then be able to hypothesize about the differences between soils. Your class can take two different soils back to your classroom for use in plant-growing experiments (see following section).

Please bring a class full of eager investigators who are dressed for being outdoors, regardless of the weather! We are looking forward to meeting you and your class.

Post-Trip Activities

With your classroom introduction and the field trip behind them, your class has a good understanding of plants and soil. The following activities further develop these concepts and help transfer ideas about forests, decomposition, and soil to the built environment, where your students will use this information.

1. Which Plants Grow?

Your students already know which ingredients are needed for plants to grow, and they've seen how these ingredients vary from place to place. In this activity they will be able to use their knowledge to predict the results in a plant growth experiment. You will need:

- 2 planting pots
- small rocks or gravel
- topsoil
- subsoil
- watering container
- Activity Sheet 5
- 2 healthy identical seedlings -- bean or zinnia should do well
- labels for pots
- pencils
- rulers

Ask the students to set up the pots with rocks in the bottom for drainage, a different type of soil in each, and a carefully planted seedling. Label the pots, set them in a window, and assign someone to make sure they are watered an equal amount twice a week. Which plant do your students expect to grow the fastest or be the healthiest? Why? What other factors may affect plant growth? How could the experiment be extended to test other variables?

As often as possible, have your students check the plants, measuring their growth and noting characteristics. Activity Sheet 5 may be a useful guide for each pot.

After several weeks, or when significant differences have occurred, review the students' predictions and the data results.

Can the data be explained? Do they remember information from the field trip that might help them explain the results?

The topsoil and subsoil vary in the amount of organic matter, nutrients, and moisture-holding properties. These differences are even found among topsoils in forests and fields. The variance in soil, plus other factors in each community (temperature, sunlight intensity, water availability, etc.) create different habitats for plants. Over time, plants with particular growth requirements will grow in areas where these needs can be met.

Thus the world is filled with a tremendous variety of plants growing in particular places. Plants that require a great deal of water grow best in wetlands, near ponds, or at the seashore, for example. Plants that do not need much light may grow well in the corner of a living room or on the shady forest floor. What about plants that grow in a vacant lot? Antarctica?

2. Urban Trees

Many of the trees around your school neighborhood can be identified and explored just like the trees your class got to know on their field trip.

- Use a tree key or identification book to learn the names of local trees.
- Adopt a tree and observe seasonal changes. Take photographs!
- Measure several leaves and twigs on similar trees. Are they the same size? What could account for differences?

- Look along the twigs for the scars that indicate one year of growth. Are some trees growing faster than others? Some branches?
- Ask a city forester how your community takes care of its trees.

3. Wood You Like to Know?

Forests are beneficial to people in a multitude of ways. They are communities of wild creatures that help us remember what vast expanses of our country looked like long ago. They prevent erosion and help regulate water flow in some areas of

the country. Outdoor enthusiasts enjoy hiking, hunting, fishing, photographing, and simply relaxing in forests. And, of course, forests provide us with wood.

Forest Products Everywhere

Ask each student to list ten different items that come from trees. A short discussion of wood products may help them get started. Lumber, pencils, baseball bats, paper, books, rulers, furniture, firewood, maple syrup, Christmas trees, and pianos are a few examples.

Use their lists to generate a master list of forest products, helping students understand, if necessary, the woody connection. As you go over each item, ask the class if this product is necessary for our survival, or helps us live comfortably. Ask if there are substitutes available for this wood product, and then, considering a variety of constraints, which resource they prefer.

Brick homes, for example, may use less wood, but the cost may be prohibitive. Books can be transferred to computers, but may be less accessible and/or enjoyable. Just how much do we depend on forest products?

Making Paper

It's sometimes difficult to believe that a living, strong tree can be processed to make paper -- writing paper, newspaper, and toilet paper! Activity Sheet 6 gives your students a chance to discover the production of paper through the maze and then review those steps by ordering them.

This maze begins with a young seedling (1). In parts of the country where pulpwood is a big business, this seedling might have grown in a nursery from carefully selected seed stock. After ground preparation (burning and fertilizing, usually), the young tree is planted.

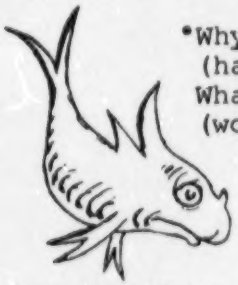
Through years of varied weather and perhaps insect attack, our tree's growth is monitored by foresters (2). When the tree reaches an appropriate size, the timber is harvested (3). In most cases this means every tree is cleared from its area, leaving the ground open for the next planting.

In the pulp mill the tree is chipped into small pieces, then boiled in a sulfate stew to break down the fibers (4). Throughout the process chemicals are added (5) to whiten the pulp, strengthen the paper, and enhance printing quality. The pulp is then spread on a screen and rolled flat (6) to squeeze out the water. The paper is dried, cut, packaged, and sent off to market (7). If your school should happen to buy this paper, you might use it to duplicate Activity Sheet 6!

You can send away for paper making information and kits; see References.

The Future of Truffula Trees

Dr. Seuss's The Lorax is a wonderful tale of a mismanaged forest resource. Either read the story or show the film to your students, and use the questions below for a follow-up discussion. Then, ask your students to write a sequel to The Lorax starting with the last seed.



- Why did the animals leave the area? (habitat destruction and pollution) What real animals are similarly affected? (wolf, bald eagle, Kirtland warbler, bluebird)
- Who was the Once-ler? (founder and leader of Thneeds, Inc.)
- Why did Thneeds, Inc. go out of business? (no more trees) What type of management practice could they have followed to prevent this problem? (plant trees, or cut fewer of them)

To Cut or Not To Cut

Even though we need wood for homes, paper, and other important items, we can't cut down all the trees because we need forests, too. By the same token, we can't protect all forested lands in the Wilderness System because we rely on wood products. Maintaining a healthy balance between these opposing needs is wise forest management.

Many foresters believe the most efficient method of harvesting trees is cutting large areas of trees all at once in a clearcut, and replanting with seedlings that grow quickly in full sunlight. The new forest will be an even-aged stand which is more easily managed than a mixed forest. Clearcuts create extreme environmental conditions, however. Seedlings often need shade cards to protect them from the unending sunlight, and loose soils can be quickly eroded. A clearcut

area disrupts other uses for forested land -- altering or removing wildlife populations and destroying recreation opportunities.

Other methods of harvesting trees involve 1) leaving a few mature trees to produce seeds for the open areas, 2) leaving broad bands of original forest to shelter the seedlings, and 3) selectively cutting particular groups of trees. Obviously, if only a few trees are removed each time, the forest will remain. But if the objective is to harvest the timber, these methods necessitate several entries of logging equipment, creating more impact and costing more money.

Forest managers must carefully weigh these methods with the climate, geography, economy, tree species, and visitor use when designing their management plan.

Nevertheless, to people who are removed from the decision-making process, forest management can be an emotional issue. After your students' experiences on their field trip and in class, they may have some feelings that are worth exploring.

Discuss with your students some of the pros and cons of cutting and protecting trees. Then ask them to think about and respond to the questions on Activity Sheet 7. When they are done, discuss their opinions in a non-judgmental way -- this is an exercise in valuing. Their papers can't be graded, as many of the questions have no right answers! They are meant to stimulate thought and discussion. Have fun!

4. Garbage - Yours, Mine, and Ours

In a forest all of the waste products from the plants and animals -- leaves, twigs, dead trees, animal droppings, and dead animals -- are decomposed on the forest floor. On the field trip your students were able to observe some of the decomposers and the process of recycling nutrients that keeps plants and animals growing. What about our community -- where do our waste products go?

With this introduction and some giggling, your students will probably realize two forms of waste products leave their homes -- waste water and garbage. The waste water is either washed into a septic tank and eventually into the ground or, in cities, added to the sewage treatment system. In either case, the water is treated and released back into the water cycle. Our garbage, however, is another story.

In most American communities, solid waste haulers pick up garbage bags of kitchen scraps, junk mail, plastic packages, old clothes, broken glass, etc. from households, businesses, and industries, and take them to a local landfill. There the garbage is compacted and buried in clay cells everyday. Landfills should be engineered properly and inspected periodically to insure that toxic residue from the decomposing garbage does not leak into the ground water and poison the wells of nearby residents.

Although burying our garbage is one of the easiest solutions, it is not a perfect one. Some communities have no available open land to use -- New York City simply dumps garbage into the Atlantic Ocean! Many areas do not have adequate soils to contain the garbage. In these cases, plastic liners or imported clay may be used.

Many of the materials that are buried in landfills are reuseable. Metals of all kinds, glass, and some paper are often recycled in communities. Some households recycle kitchen scraps and leftovers through compost piles to gardens. The following activities will help your students understand decomposition in the natural and built environments.

What Happens to Garbage?

On a hike around your school, and with an excavation of a lunchroom garbage can, collect a variety of typical waste products -- gum wrappers, bottle caps, apple cores, dead leaves, homework papers, plastic bags, etc. Ask your students to record these objects on a piece of paper so they will be able to detect changes in their appearance, size, or weight after a few weeks. Then, drop the garbage in a nylon stocking, and, as a group, bury it outdoors or indoors in a bucket of dirt. If you take the indoor option, try to water the bucket every time it rains. The nylon stocking will help you find the garbage again.

Once a week, uncover your garbage and record the changes. What is decomposing? What is not?

Encourage your students to bury as many different types of materials as possible -- rubber, cloth, paper, feathers, hair, metal, glass, etc.

Class Trash

Weigh your classroom garbage every day. What do your students throw away? Can anything be reused? How can your class and your school cut down on your contributions to the local landfill? (Reuse paper, compost vegetable scraps,

collect cans and bottles from the kitchen for your local recycling center, etc.) Have your class lead a school campaign!

Compost Compote

Compost piles can be sweet-smelling buried treasure for gardeners. Have your class research the elements of a compost pile and begin to recycle their lunch scraps. An easier outdoor recycling project involves burying the scraps every day in a small plot of ground. Your students may want to record what goes into the earth, and periodically try to find it again. Then note any changes -- the number of worms, the color of the soil, the moisture, and the temperature. Try growing plants in the compost as in Activity 1.

A more exciting form of composting involves a box of worms right in your classroom! The worms can be carefully tended and fed by your students every day. Worms Eat My Garbage (see References) explains how to build a 2' x 2' box and set up your clean, odor-free worm bin. Doesn't your classroom need a mascot?!

Community Garbage

Take a trip to a local landfill, or invite a member of the landfill's supervisory board (City Engineer, Board of Public Works, County Commissioner, or private owner) to your classroom to discuss how the landfill works, and some of the issues involved with our garbage.

Who pays for the land used as landfill?
What will become of the land when the landfill is full?
How do people decide where to put a new landfill?
What are some problems with landfills?
What are other ways to get rid of our garbage?

Recycle It

Many communities have recycling centers that would love your help and support. Find out what materials they take, how they must be prepared, and encourage your students to help their families recycle. By recycling

paper, glass, metals and/or plastic, you can return resources to markets and save space in your landfill.

Congratulations! You have finished this passage through the plant kingdom. From the basics of botany and tree identification through decomposers, soil, and forest ecology, your students got a first-hand study of one corner of our natural world. Many of these concepts were extended to the built environment through a look at urban trees, wood products, and garbage. In addition to teaching this information, you've begun to prepare your students for making responsible decisions about our future environmental quality. That's terrific!

Name _____

PLANT GROWTH DATA SHEET

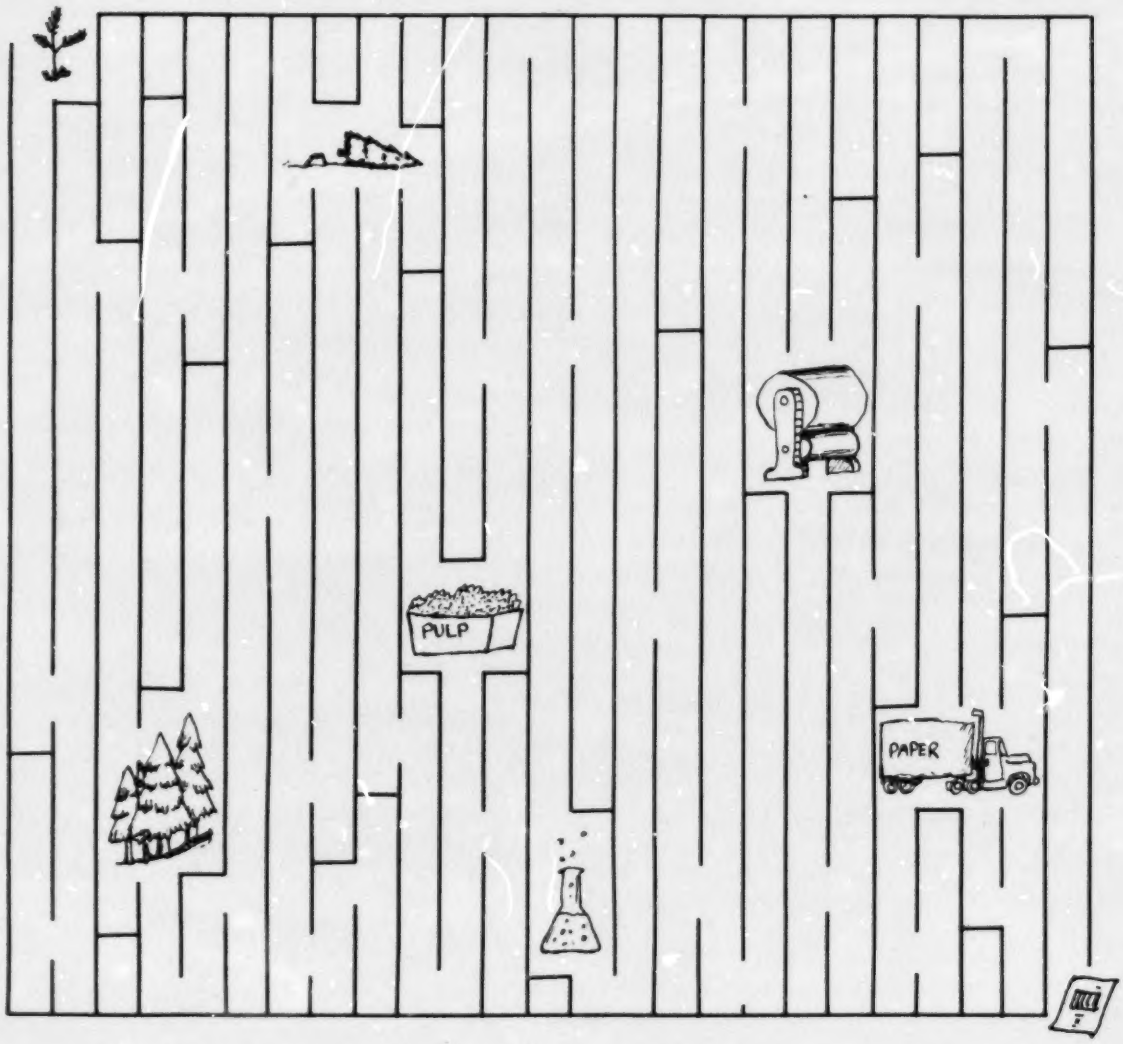
Pot # _____ Soil Type _____

Date	Height From Soil	# of Leaves	Color of Plants	Observations
Day 1				
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				
Day 8				
Day 9				
Day 10				

Name _____

A-MAZING PAPER

Directions: Follow the process of growing a tree to make paper by tracing the pathway through each step. Do not cross any line.

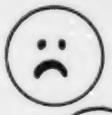


Match each step of the paper-making process to the right number.

1	•a piece of paper
2	•a vat of pulpwood
3	•a seedling
4	•a truck carrying paper to market
5	•chemicals to bleach the pulp
6	•a tree
7	•a roller to press the pulp to paper
8	•a log in the forest

Name _____

Directions: Circle the face that describes how you feel about each question.

= I agree = I'm not sure  = I disagree

1. Trees are here for us to use. We should cut as many as we want.

2. Trees are beautiful. No trees should be cut.

3. We should not waste school paper, but use both sides or smaller pieces.

4. We can always plant more trees so we shouldn't be worried.

5. We should cut some trees and save others.

6. Kids can't really do anything to protect trees.

7. It's important to cut trees so that some moms and dads can have jobs in the paper business.

8. We shouldn't worry about animals that live in the forest.

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*These books are available at the Jackson District Library. Similar titles may be found at the Jackson District Library's 16 branches under the same Dewey Decimal Numbers.

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At REMC. . .

The Jackson County Intermediate School District's Regional Educational Media Center has the following:

Films:

"Ecology of Forests"	MP 344
"Leaves of Green"	MP 2177
"The Lorax"	MP 997
"Molds and How They Grow"	MP 1879
"Plant Life At Work"	MP 1937
"Plants Obtain Food"	MP 1939
"Recycling Our Resources"	MP 1331
"Soybeans -- The Magic Beanstalk"	MP 1444
"The Terrarium -- Classroom Science"	MP 1540
"The Woods and Things"	MP 1678
"What Flowers Do"	MP 1[illegible]8
"Watch Out for My Plant"	MP 16[illegible]

Other:

Exploring and Understanding Plant Structure and Plant Function Filmstrip - Science Shelf 11	SE 1184.1
"Introduction to Plants" Kit - Science Shelf 13	KT 226
Investigations in Science: Earth Science Filmstrip - Science Shelf 4	SE 0711
"Plant Life" Study cards - Science Shelf 3	SE 3683
Plastic Flower Model Science Shelf 17	SE 1184.1
"Some Plants -- A Look at Variety" Study cards - Science Shelf 3	SE 1390
"Trees" Wood, leaves, and pictures kit Science Shelf 5	KT 719.1

And Elsewhere. . .

•These teaching aids are available through the Kent Intermediate School District, 2650 East Beltline, SE, Grand Rapids, MI, 49506, for a small fee.

Recycling
The Importance of Being a Garbologist
To the Dump
Spring Wildflowers
Adopt a Tree
Woodland Ecology

•"The Man Who Couldn't Stop Sneezing," a story about our dependence on wood products, is available for $1.50 from

Nova Scotia Government Bookstore
P.O. Box 637
Halifax, Nova Scotia
CANADA B3J 2T3

•"How Paper Comes From Trees," Southern Forest Institute, 2900 Chamblee Tucker Road, Building 5, Atlanta, GA 30341. 20¢ each.

•"How You Can Make Paper," American Paper Institute, 260 Madison Avenue, New York, NY 10016. Single copy free.

•Paper Making Kits with samples, ingredients, and directions:

Western Forestry Center, 4033 Southwest Canyon Road, Portland, OR 97221. $5.00 each.

Minnesota Forest Industries Information Committee, 208 Phoenix Building, Duluth, MN 55802. $5.00 each.

•A wide range of teaching materials on trees, forestry, and wood products are available from the United States Forest Service, U.S. Department of Agriculture. Check with your regional USFS office, or State Forest Department. Of special interest are:

"Life, Death, and Rebirth of a Tree"
Poster FS-356

"Forests for the Future"
Brochure 695-143

and a series of Smokey Bear posters, CFFP
7 through 14.

•"Billy B Sings About Trees" is a wonderful record of sing-along tree songs for children. Available through National Wildlife Federation, 1412 16th Street, NW, Washington, D.C. 20036.

FORESTS AND FLOWERS

Third Grade Spring Trip

Formal Objectives

Learn about plants by identifying their parts and structures.

Demonstrated the use of a scientific key by using it to identify trees.

Learn about common wildflowers.

Understand soil composition by analyzing several types of soil.

Demonstrate an awareness of decomposition by following nutrients through a simple cycle.

Informal Objectives

Enjoy the Dahlem Center.

Take a closer look at plants and plant parts.

Understand the role of decomposers.

Understand the forest community.

Appreciate diversity in the plant kingdom.

Indoor Portion

Welcome the group, introduce yourself, the guides, and the Dahlem Center.

Introduce plants to the kids by asking what plants need to grow, and which parts of plants allow the plants to obtain these critical ingredients for life. As they name what plants need and which part provides this, draw a plant on the board.

roots - absorbs nutrients and water, support the plant

stem - extends the plant to the best spot in the sun and conducts liquids up and down the plant on a 2-way transport system

SE045124

leaf - collects sunlight and makes food through photosynthesis

flower - makes seeds for next season

Then delve into the flower with detail:

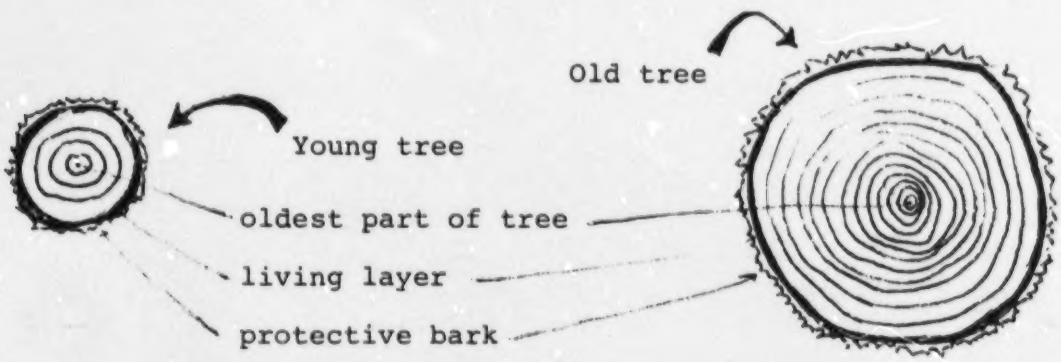
petal - attracts pollinator by color or smell

sepal - protects flower bud

pistal - collects pollen, contains the egg, grows the seed

stamen - produces pollen

Switch over to tree physiology (the roots stem, leaves, and flowers perform the same functions) and take a quick look at the cross section of a tree trunk.



Introduce the interactions among different members of the forest community with the Forest Community poster or the poster or the Animal/Plant Air Ballet.

Divide the kids in half and arrange them in two lines facing each other. One line will be the animals, the other will be plants. The animals take in oxygen (stretch arms twoard the plants and pull in), use it all over their bodies (wiggle around), and breathe out carbon dioxide (push arms toward plants). The plants collect the carbon dioxide (bring outstretched arms in), suck up water from the roots (bend over and "pull" water along their leg), absorb sunlight through leaves (hold arms to each side, palms up and shout "Hey!"), make food, and emit oxygen (push arms out toward animals). Run each half through their part, then put it together and build up speed to levels of near craziness. Then run the cycle in slow motion, one more at regular pace, and call it quits! Now you are ready to explore all these wonderful things outside!

Outdoor Portion

1. With hand lenses, have the kids examine the flower parts for familiar pieces. They should see sepals, petals, stamens, and pistel(s) on everything. Marsh marigold, pear tree, and service berry are the earliest flowers. Trillium, lilac, wild geranium, and Jack in the pulpit are mid-season. Golden Ragwort and mayapple bring up the rear.

2. Also with hand lenses, look at a variety of plants -- moss and spore capsules, ferns, tree bark, developing pine cones, fungus (not plants), lichen, buds (very important), etc.

3. At the downed, cut tree near the path, use the cross-section to show annula tree growth. This tree was knocked over in the July, 1980 wind storm. The rings show years when it grew quickly, and years when the growth was slow. There is a set of Life-of-a-Tree cards which can be used to illustrate the different processes and systems (birth, growth, flowering, maturity, defense, protection, death, recycling, and rebirth) a tree goes through.

4. Anywhere in the woods stress that all living organisms eventually die, and these "waste" products decompose on the forest floor. Tree trunks, libs, leaves every year, plus animal bones and scat are broken down into reusable nutrients. Ask the kids what organisms are decomposers -- ants, beetles, centipedes, sowbugs, mites, moss, fungus, mold, lichen, bacteria (any insect or plant that breaks apart a tree would fit in this category). Other "decomposers" are rain, wind, snow, ice, heat, etc. Have the kids explore a rotten log or the soil's surface for decomposers.

   I often show the kids a leaf from the last growing season, and one from the previous year that looks more decomposed. Then I challenge them to find leaves from two and three years ago. It's hard!

5. After the decomposer discovery, use their knowledge of decomposed organic material as one component of soil to determine what else is in soil, and how it differs from one site to another.

   At the start of the long, dug pond boardwalk, ask two kids to collect surface soil from the forest and two to collect surface soil from the field to ½ fill two baby food jars. When the kids come back, take 1 jar of potting soil, add 3 pinches of alum, fill to 3/4 with water (from the ditch), and shake. Set this jar down

to settle and have the kids complete the experiment with their jars. Make sure the amounts of soil in each are similar. During the time that these jars settle, take the soil sampler and the kids to collect a column of dirt. The top soil will be darker than the subsoil because the decomposers have worked organic matter into it. The subsoil generally has more clay and/or more sand than the top soil. If time allows, try an alum shake test with the subsoil, too.

The alum shake test will sort the soil materials into layers. Large sand and gravel pieces will sink to the bottom, with finer grades of silt above. The top of the soil will have the organic matter, and floating on the surface of the water will be larger pieces of plants. The potting soil is mostly organic matter, with some vermiculite (holds moisture) and a few san particles. It will look unsorted in comparison to the forest and field soil. Of the latter, the forest should have more organic material. Where is the best soil for a garden? How do farmers improve the nutrients in their fields?

6. If time allows, use the Dahlem Tree Key to help kids identify trees. They should know how to use a key and some of the characters to look for. Find unlabeled trees in the Arboretum to key out -- the wild black cherry, basswood (between Special Needs railings), white cedar, black and white oak, hickory, sumac, pine, and sycamore are on the tree key.

7. While in the woods, emphasize the interactions between all the "players" in the forest community -- producers, consumers, and decomposers -- and the interdependence that links them together. (See Apartment House and Recipe for a Forest.) Include human dependence upon forests -- fuel, wood, and some foods. And mention some post-trip activities on Forest Resources.

Let's compare this forest to an apartment house--what's the very bottom story in an apartment house?" *The basement.* "Right. The basement. That's where the sewage and garbage disposal is taken care of. That's also where you would find the plumbing. It's the foundation upon which the rest of the building stands and usually there's a storage area in the basement, too. What would be the basement of the forest?" *The soil. The roots and stuff.* "Sure. And what do you find going on underground in the forest? Pretty much the same kinds of things, don't you? Let's lie down on our backs. I want you to pretend now that we're all roots of one tree in the forest. Reach your arms down underneath the leaves and into the soil as far as you can--then curl them up and come back up and feel the undersides of the leaves.

"Don't look at your hands--look straight up toward the sky. How does the basement feel?" *Kind of moist. Cool.* "Like a basement? Hold still--you're a tree root. Wait for something to happen down there. Is there any life going on around you? Who's at work in the basement?" *Ooh. It's creepy. There's something on me! You can feel little things moving around.*

"What's the next floor of the apartment house, as you move up from the basement?" *The first floor.* "That's the main floor, right? That's where you find the lobby, where most of the traffic--the people moving in and out--will be. You might find a few shops there, with a little buying and selling going on, and perhaps a coffee shop, too. It's about the busiest floor in terms of people moving in and out, right? What would you say might be the comparable part of the forest?" *The surface.*

"Let's look at our ground floor--the forest floor. What do you see, say, in the first foot or so of the forest, above the soil? Let's turn over and lie on our stomachs and look at this level. What kinds of things live on this floor?" *A few plants. Little trees.* "What kinds of things don't exactly live here, but go through here, like the lobby, as visitors,--or maybe come here for a snack at the coffee shop?" *Animals. Deer. Raccoons. Foxes.* "What about us?" *Yeah.*

"Then, as you move up, you come to the floors of the building where most of the 'people' actually live, right? That's where you'll find the families. And those floors make up most of the building. What about here--what are the levels where most of the 'people' live?" *The trees.* "What kind of people live here?" *Chipmunks. Squirrels.* "Ah. Where do most of the chipmunks live?" *On the ground.* "Do you see chipmunks climbing very far into the upper levels? Or do they stay mostly toward the lower floors of the apartment house? Then who lives up in the middle part?" *The squirrels.* "What happens when a chipmunk starts to go too far up in the apartment house--what do the people that live farther up think about it when he starts to get up onto their floor?" *They don't like it much.* "Right--they'll probably fight him off or chase him away, won't they?" *Because that's where they live.* "Yes, we say it's their territory."

"Then, what do you find clear at the top of the apartment house, usually taking up the entire top floor?" *The penthouse.* "Who usually lives there?" *Somebody rich.* "Well, let's say that in our penthouse we have a rich, famous movie star--no, a singer. He might wear some pretty fancy clothes, but he's especially noted for his singing. In fact, we've heard him today. What's the top floor, here, and who lives there?" *The top branches of the trees--where many of the birds live.* "Then over the whole building, what do you have?" *The roof.* "What does it do?" *It keeps the rain out.* "Anything else?" *And the sun, too.* "What lets the sun in?" *Windows. Skylights.* "Do we have any skylights in this particular building?" *Very few.* The roof is pretty solid, isn't it? Would you say it had large shingles or small ones?" *Large.* "Now we're going to do something a little bit different. If you'll step this way, please, we'll take a stop off at one floor that we didn't mention before. Have you ever stood on the mezzanine of the apartment building or hotel and looked down on the lobby?"

"Apartment Houses"
from Acclimatization
by Steve Van Matre